



Volcanic Aerosol

Recommended Age:

Intermediate Level (Grade 5-8); Secondary Level (Grade 9-12)

Guiding Question:

What effect do volcanic eruptions have on the Earth's climate, and how can we tell?

OBJECTIVES

Concepts:

Volcanic eruptions release small particles (aerosols) into the atmosphere, which are thought to reflect incoming solar radiation (thus cooling the climate).

Principles:

1. There are different different types and sizes of eruptions.
2. Certain large eruptions are thought to release enough aerosols in the form of SO₂ (sulfur dioxide) to cool the climate. Aerosols clouds from such eruptions can be detected from orbiting satellites.
3. There are many factors which influence climate, and a large eruption does not automatically mean that a cooler year is to follow.
4. Accurate data is scarce; aerosol-detecting satellites are obviously a fairly recent development, and even accurate temperature readings are difficult to obtain for years prior to the last century or so. This makes it difficult for scientists to draw any definite conclusions, as scientific theories must be based on evidence.

Facts:

1. Past eruptions can be given a general magnitude rating, based on factors such as the height of the aerosol cloud and the total volume of material released during the eruption. This rating is called the Volcano Explosivity Index (VEI). Eruptions are given a number from 0 (the smallest or least explosive) to 8 (the largest). Eruptions with a rating of 6 or higher are rare.
2. The eruption of Mt. Pinatubop (1991) is thought to rate 6 on a VEI. The average global temperature in 1992 was approximately 0.28 degrees Celcius cooler than the average temperature for 1991.
3. The eruption of Tamboro in Indonesia in 1813, with a VEI of 7, is suspected to have caused the "year without a summer" in which killing frosts destroyed crops and caused famine.
4. Average temperatures worldwide the year after the 1982 eruption of El Chichon, Mexico (VEI of 5) were actually 0.22 deg. C warmer than they were for the year of the eruption.
5. NASA's Total Ozone Mapping Spectrometer (TOMS) instrument detected the Mt. Pinatubo aerosol cloud from space. Other eruptions have been similarly detected by satellites.